CLAIMS:

1. A method for extracting geometrical data from a 2-D digital image of the spine, comprising steps for determining spine outlines, wherein:

- digitizing the spine center line and end points of said spine center line;
- constructing a 2-D Rectangular-Band around said spine center line;
- processing the 2-D Rectangular-Band image data in order to estimate best paths going through selected points for determining the spine outlines.

2. A method as claimed in Claim 1, wherein the steps for constructing the Rectangular-Band comprises:

- constructing, in the 2-D digital image, a 2-D image band, referred to as Rubber-Band, whose center line is a spline representing the spine center line, and unfolding said Rubber-Band for constructing a 2-D Rectangular-Band; and
- calculating the intensities of the points of the Rectangular-Band from the intensities of the corresponding points of the Rubber-Band.

3. A method as claimed in one of Claims 1 or 2, wherein the step for estimating the spine outlines comprises estimating the best paths as lowest cost paths linking points selected by a contour detection operation optimizing a cost function composed of a local cost favoring the points having intensity characteristics that are optimum in the direction orthogonal to the spine centerline and a transition cost which constrains the path to go smoothly from one point to a next point.

4. A method as claimed in Claim 3, wherein a prior knowledge relating to spine vertebra width and to spine length is used to optimize the local cost.

5. A method as claimed in one of Claims 3 or 4, wherein digitized guide-points are added to the found outline points to compel the best paths to go through them.

6. A method as claimed in one of Claims 1 to 5, further comprising steps of processing said 2-D rectangular image band image data in order to estimate spine endplates locations using the data of one corresponding found spine outline.

7. A method as claimed in Claim 6, wherein said steps comprise:

- starting from the points of said corresponding found outline and determining twice the best path to reach the spine center line, a first time in following a upward edge gradient direction and a second time in following a downward edge gradient direction, and
- storing the costs relating to said best paths.

8. A method as claimed in Claim 7, wherein the best path to reach the spine centerline is estimated by a contour detection operation optimizing a cost function composed of a local cost favoring the points having intensity gradients that are optimum in the direction parallel to the spine centerline and a transition cost which constrains the path to go smoothly from one point to a next point.

9. A method as claimed in one of Claims 7 or 8, further comprising steps of:

- constructing a first and a second cost profiles for the upward and downward directions, at locations along the spine center line,
- determining the up-endplates and down-endplates locations as respective minimum of the first and the second cost profiles, said locations being referred to as nodes.

10. A method as claimed in Claim 9, for determining the respective nodes of the cost profiles, comprising steps of:

- adding initial knowledge of the number of endplates and of the location of the endplates of a first considered vertebra and of a last considered vertebra in the image, said locations being defined by points digitized on the spine centerline,
- defining intervals, along the spine centerline, where it is probable to find an endplate, in the first and the second profiles, and defining standard deviations with respect to said intervals, using a database knowledge,
- assigning a label of first endplate to the first node, and labeling progressively the nodes to the last endplate, thus determining by accumulating standard deviations, several nodes to said last endplate,

- redefining the appropriate label to the last node by using the initial knowledge of the last endplate location and correcting the labeling of the previous nodes accordingly by backtracking toward the first node.

11. A method as claimed in one of Claims 6 to 10, further comprising steps of determining points of the spine, referred to as corners of vertebrae, located at the intersection of the outlines and the endplates.

12. A method as claimed in Claim 11, further comprising steps of digitizing guide points that are set on the corners of the vertebrae to improve the labeling of the nodes.

13. A method as claimed in one of Claims 1 to 12, comprising previous normalization of the point gradients within a range of gradient values to compensate for possible undue differences of brightness in regions of the original image.

14. An imaging system having acquisition means for acquiring images of the spine, having display means to display said images, having interactive drawing means to digitize the spine center line, the end points and guide points, having storage means to store the initial knowledge and database knowledge, storage means to store image data, and having processing means to carry out a method as claimed in one of Claims 1 to 13.

15. An imaging system as claimed in Claim 14, wherein the processing means comprise a suitably programmed computer of a workstation or a special purpose processor having circuit means, which are arranged to process the image data, and wherein the display means displays the processed images.

16. A medical examination apparatus having the system of one of Claims 14 or 15.

17. A computer program product comprising a set of instructions for carrying out the method as claimed in one of Claims 1 to 13.